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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the in-wheel motor of an electromobile, especially relates to an outer rotor-type motor mechanism.

[0002]

[Description of the Prior Art]The conventional outer rotor-type motor is shown in "IZA" which the Tokyo Electric Power developed, JP,1-298903,A, JP,11-187506,A, etc., for example.

[0003]Drawing 4 is a mimetic diagram of the outer rotor type in-wheel motor of this conventional electromobile.

[0004]In this figure, the coil 102 fixed to the body side and the inner stator 101 which has the iron core 103 are arranged, It is supported pivotally by the inner stator 101 so that this inner stator 101 may be countered, It was constituted as a unit in which the outer rotor 105 which has the permanent magnet 104 has been arranged, and this unit was attached to the rim 108 and knuckle spindles of a wheel which have the tire 107 via the motor case 106. The bearing with which 109 supports the outer rotor 105 pivotally, and 111 are disk brakes which apply braking to the outer rotor 105.

[0005]

[Problem(s) to be Solved by the Invention]As described above, since the conventional outer rotor type motor was made into the unit construction, i.e., an independent assembly, the diameter of the rotor related to driving torque was not able to be directly utilized to the full rim inside diameter. Since a motor, knuckle spindles, and hub bearings were constituted independently, many parts were needed as a whole and structure was complicated.

[0006]The purpose of this invention is as follows.

In view of the above-mentioned situation, unify a motor mechanism, a rim, and a knuckle-spindles mechanism, and miniaturize.

By size attributing the outer rotor outer diameter of a motor, take a large torque radius and provide the in-wheel motor of the electromobile which made thickness thin.

[0007]

[Means for Solving the Problem]In order to attain the above-mentioned purpose according to this invention, [1]In an in-wheel motor of an electromobile provided with an inner stator fixed to the body side, and an outer rotor which is supported pivotally by this inner stator and has a permanent magnet, Attached a yoke part of said outer rotor to a drum section of a wheel in one, and said yoke part was used as a reinforcing member of said drum section, and said yoke part and a drum section were made into a flux path of said permanent magnet.

[0008][2]Above[1]In an in-wheel motor of an electromobile of a statement, a peripheral part of said outer rotor is combined with said drum section in one by adhesion attachment methods, such as a screw, a spline, and press fit.

[0009][3]Above[1]In an in-wheel motor of an electromobile of a statement, said inner stator has a stay part extended to the body side, and combined this stay part with joint for a suspension arm or suspension attachment.

[0010][4]Above[1]In an in-wheel motor of an electromobile of a statement, a brake drum or a disk rotor was fixed to said outer rotor, and a disc caliper or a pack plate assembly was fixed to said inner stator.

[0011][5]Above[1]In an in-wheel motor of an electromobile of a statement, a water pump is driven by said outer rotor, and an engine water jacket is provided in said inner stator, and said inner stator is cooled with said water pump.

[0012]

[Embodiment of the Invention]Hereafter, it explains in detail, referring to drawings for the embodiment of this invention.

[0013]Drawing 1 is a figure showing the principal part of the outer rotor type in-wheel motor of the electromobile in which the example of this invention is shown.

[0014]In this figure, it is a wheel which 1 equips with a tire and 2 equips with the tire 1.

Although the usual wheel comprises the Webb part and disk part into which a tire fits, the wheel 2 is constituted by only the Webb part in this invention.

[0015]3 is a motor and comprises the outer rotor 30 and the stator 40. The outer rotor 30 was provided with the yoke part 32 which forms the permanent magnet 31 and a magnetic path, and the stator 40 is provided with the iron core 43 and the coil 42. The outer rotor 30 is supported by the stator 40 via the motor bearing 5 which serves as hub bearings, enabling free rotation.

[0016]Screw joining, spline combining, or the planes of union 25 and 35 that carry out fitting combination are mutually formed in the peripheral face of the yoke part 32 of the outer rotor

30, and the inner skin of the drum section 21 of the wheel 2, and the yoke part 32 and the drum section 21 are combined in one.

[0017]Therefore, the magnetic path of the permanent magnet 31 is formed of the yoke part 32 and the drum section 21. The drum section 21 is a ferromagnetic material. The intensity of the drum section 21 of the wheel 2 is reinforced by the yoke part 32. Positioning and immobilization of the wheel 2 to the outer rotor 30 are performed by the taper surface 32a of the outer rotor 30, and the taper surface 70a of the tie-down plate 70 bound tight by the outer rotor 30 with the bolt 23. Therefore, when removing the wheel 2 from the outer rotor 30 by the blowout of a tire, etc., the wheel 2 can be removed rightward from the outer rotor 30 by loosening the bolt 23 and removing the tie-down plate 70.

[0018]The stator 40 equips the upper part and the lower part with the stay parts 41a and 41b, and the stay part 41a is combined with the upper joint 61 of a suspension device, and it has combined the stay part 41b with the Rhoer joint 62.

[0019]44 is an engine water jacket for water-cooling the stator 40.

[0020]Next, a brake mechanism and a water cooling system are explained using drawing 2 in which whole this invention is shown.

[0021]Drawing 2 is a sectional view of the outer rotor type in-wheel motor of the electromobile which has the brake mechanism and water cooling system in which whole this invention is shown.

[0022]80 is a drum brake and consists of the wheel cylinder 83 attached to the brake drum 81, the back plate 82, and the back plate 82, the shoe 84, and the friction material 85 which adhered to this shoe 84. It is fixed to the bracket plate part 71 extended to the radial inner side of the tie-down plate 70 by the bolt 86 and the nut 87, and the brake drum 81 is constituted so that rotation of the wheel 2 30, i.e., an outer rotor, may be transmitted to the brake drum 81.

71a is a vent hole for missing the heat generated at the time of a brake in the open air.

Although the bracket plate part 71 is made into disc shape in the example, as long as it can support the brake drum 81 with high rigidity, it may be what kind of structure and may constitute from two or more arms extended from the peripheral part of the tie-down plate 70 to inboard.

[0023]The back plate 82 is being fixed to the bracket plate part 45 radially extended from the stator 40 with the bolt (not shown) etc. 45a is the vent hole established in the bracket plate part 45.

[0024]Next, a cooling system is explained.

[0025]90 is a water pump and the main part is being fixed to the bracket plate part 45 of the stator 40 with the bolt etc. The driving member 91 fixed to the tie-down plate 70 by the bolt 86 and the nut 87 is provided with the driving shaft 92 in which the spline 93 was formed, and is carrying out spline combining to the input shaft of the water pump 90. Therefore, the water

pump 90 is driven by the wheel 2 via the tie-down plate 70 and the driving member 91.

[0026]It connected with the radiator 94 via the piping 95, and the admission port 90a of the water pump 90 has connected the delivery 90b to the engine water jacket 44 of the stator 40 via the piping 96. Therefore, the cooling water supplied from the water pump 90 is uniformly supplied to the engine water jacket 44 by the annular passage 44a established in the left edge part of the engine water jacket 44. The piping 97 is a return pipe from the engine water jacket 44 to the radiator 94, and the heated cooling water returns to the radiator 94 via the piping 97, and is cooled there.

[0027]Although the radiator 94 is positioned in the good direction of breathability and he is trying to cool by the running wind at the time of a run, the fan for cooling may be formed.

[0028]Next, the example which incorporated the disk brake as a brake mechanism is described according to drawing 3.

[0029]Drawing 3 is a figure showing the outer rotor type in-wheel motor of the electromobile which incorporated the disk brake as a brake mechanism of this invention, drawing 3 (a) is the sectional view, and drawing 3 (b) is a front view of the disk brake.

[0030]The disk brake 180 is provided with the disk rotor 181 and the caliper 182, and the disk rotor 181 is being fixed to the bracket plate part 71 of the tie-down plate 70 with the bolt 186. The caliper 182 is provided with the hydraulic cylinder part 183 and the friction material 185, if brake fluid pressure is transmitted to the hydraulic cylinder part 183, the friction material 185 will be pushed against the disk rotor 181, and a brake will act. 146a is a spline and 146b is a bracket.

[0031]Spline combining of the caliper 182 is carried out on the cylindrical guide part 146 of the bracket plate part 45 of the stator 40. Therefore, the disk brake 180 can be removed by removing the bolt 23 which is fixing the tie-down plate 70 to the outer rotor 30.

[0032]This invention is not limited to the above-mentioned example, and based on the meaning of this invention, various modification is possible for it and it does not eliminate these from the range of this invention.

[0033]

[Effect of the Invention]As mentioned above, according to this invention, the following effects can be done so as explained in detail.

[0034](1) Since he is trying to form the yoke part of an outer rotor, and the drum section of a wheel in one, Since can enlarge the torque radius of a motor, the intensity of the drum section of a wheel is given by the drum section and yoke part and he is trying to let a yoke part and a drum section pass for magnetic flux, the weight saving of a wheel and the yoke part can be carried out as a whole.

[0035](2) Since a brake mechanism is arranged to the radial inner side of a stator and axial width of the whole - in-wheel motor mechanism is made thin, The joint part of a suspension

device can be brought enough close to a centre-of-the-wheel line, and a kingpin angle and a scrub radius can be doubled with a car, and can be set up freely (to optimum).

[0036](3) Since the stay part of the stator is made into the structure coupled directly with the joint part of a suspension device, a knuckle-spindles mechanism becomes unnecessary.

[0037](4) Since a water pump is formed in a wheel and he is trying to drive the water pump with a wheel, it is not necessary to supply cooling water to the wheel side from the body side, and structure is easy and can be miniaturized.

[Translation done.]